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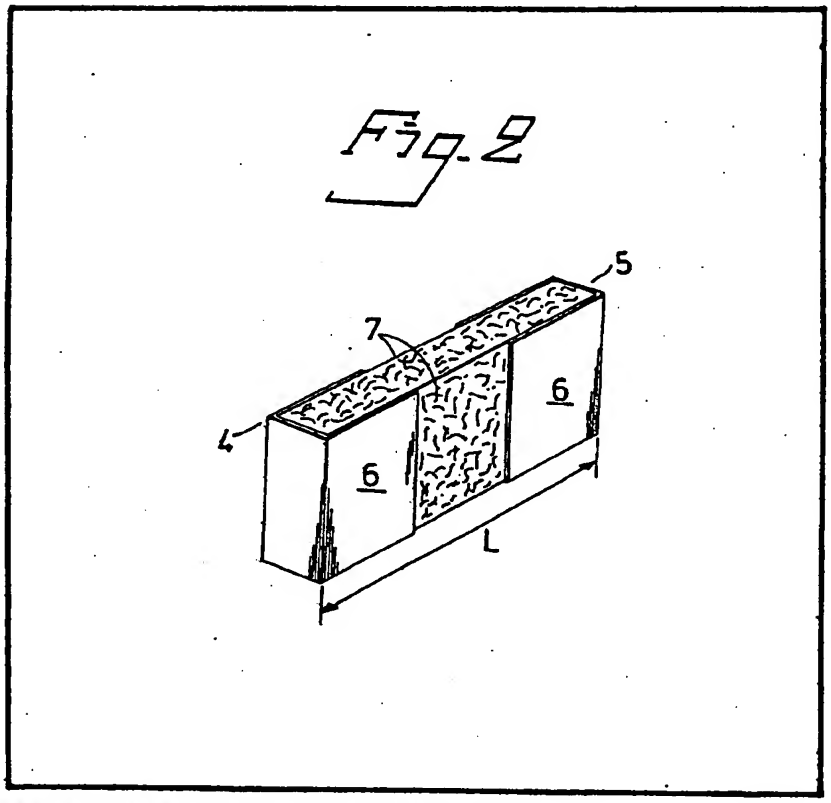
F1B
(71) Applicant
AB Bahco Ventilation,
(Sweden),
S-199 81 Enkoping,
Sweden
(72) Inventor
Berit Irene Persson
(74) Agent and/or address for service
Haseltine Lake and Co,
Hazlitt House,
28, Southampton
Buildings,
Chancery Lane,
London,
WC2A 1AT

(54) Silencing in ventilation ducts

(57) Each of the sections of sound-absorbing material, e.g. mineral wool, forming a wall covering and/or a baffle extending in the direction of air flow in a rectangular or circular duct (Figs. 1 and 3) is covered by unperforated material 6, e.g. sheet metal, at its upstream and downstream end regions 4 and 5 and an intermediate portion 7 is uncovered or covered by expanded or perforated sheet metal with an aperture area of at least 20%. The sections of material may each have a length L equal to one quarter of the wave length of the sound frequency to be most silenced.



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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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Fig.1

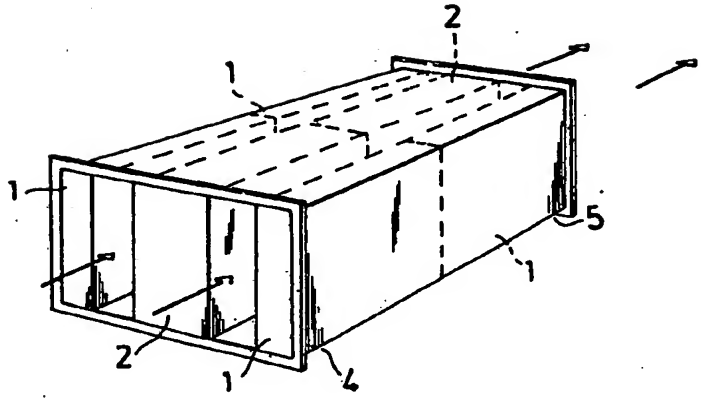


Fig.2

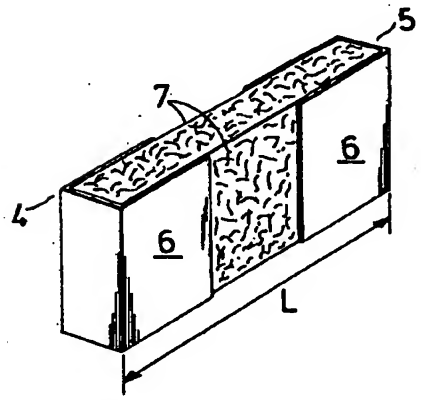
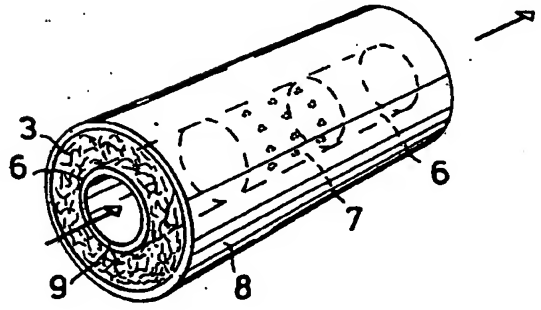


Fig.3



SPECIFICATION
Silencer

The invention relates to a silencer or noise suppressor intended for ventilation ducts or ventilation apparatus, and comprises porous elements, e.g. of mineral wool, serving as resistive sound-absorbent units, said elements being arranged as wall cladding or baffles swept over by the stream of air in a duct or apparatus casing.

Previously known silencers of this kind have generally not had completely satisfactory low-frequency damping. Silencers of other kinds, e.g. diaphragm absorbers, afford better low-frequency damping and are known to the art, but silencers of the former kind are often to be preferred for various reasons.

The object of the invention is therefore to provide a silencer of the kind described in the introduction, which has improved low-frequency damping, although its high-frequency damping is sufficient to meet the requirements made for ventilation plant.

The desired result is obtained by the silencer being given the characterizing features disclosed in the following claim 1.

Two embodiments of the invention are described in detail below with reference to the accompanying drawing, whereon

Fig. 1 illustrates a silencer intended for a ventilation duct with a rectangular duct cross-section,

Fig. 2 illustrates a baffle incorporated in the silencer of Fig. 1,

Fig. 3 illustrates a further silencer intended for a ventilation duct having a circular cross-section.

The silencer illustrated in Fig. 1 comprises six porous elements 1 and 2, arranged as baffles in a casing constituting an ordinary ventilation duct with rectangular cross-section. The casing is usually made from sheet steel. The porous material in the baffles is suitably mineral wool.

In the embodiment illustrated in Fig. 1, the silencer is assembled with three rows of baffles, each row including two baffles placed end to end. The rows are oriented in the through-flow direction of the air stream. The baffles 2 are swept by the air stream while the baffles 1 are placed adjacent mutually opposing duct walls and are only swept by the air stream on one side.

The construction of a baffle will be more closely seen from Fig. 2. Each baffle may have its upstream and downstream ends 4 and 5, surrounded by substantially unperforated sheet material 6, preferably sheet metal, extending a distance along the side surfaces of the baffle in the path of the air stream. The porous material of the baffle is thus left uncovered along an intermediate portion 7, which is unclad or (not illustrated in Fig. 2) covered by a perforated material.

Expanded metal, perforated metal sheet or the like, with at least 20% aperture area may be used for such perforated material.

The substantially unperforated material 6 extends suitably over about 2/3 of the porous element length L in the flow direction of the air stream or in the direction of sound propagation. The intermediate portion 7 should be substantially central along the distance L.

It is also suitable that the distance L is selected to be 1/4 of the wavelength of the low frequency which is intended to be more heavily dampened than what the absorber enables per se.

As will also be seen from Fig. 2, the baffle is made from a porous element in the form of a straight, parallelepipedic body having at either end an unperforated sheet 6 covering the end wall of the element and folded around the edges thereof to extend a distance along its sides swept by the air stream. The portions of the sheet 6 situated on the sides of the element are shown to be flat, with their terminating edges defining the intermediate free portion 7 of the element oriented substantially at right angles to the long edges of the sheets along the sides of the element.

Fig. 3 illustrates a silencer with an exterior, unperforated, cylindrically shaped casing 8, e.g. of metal sheet, and a perforated tube 9 placed in the casing and coaxial therewith to serve as a passage for the air stream. The space between the casing 8 and the tube 9 is in this case filled with the circularly shaped porous element 3 only constituting wall cladding. Here, the intermediate portion 7, described in conjunction with figures 1 and 2 for the first embodiment, consists of the perforated portion of the tube 9. This perforated portion can be restricted by the remainder of the tube upstream and downstream of the portion 7 being unperforated, or by the tube being perforated for the whole of its length by having its walls screened off by substantially unperforated material upstream and downstream of the portion 7. In the latter case, this unperforated material may suitably be the ends of adjoining ducts or stub ends thrust into the tube 9.

The silencer described above in conjunction with a pair of embodiments affords, by reason of the partial enclosure using the substantially unperforated sheet-like material 6, a combination of resistive and reactive damping. The result of this is substantially improved low-frequency silencing without unfavourably large reduction of the high-frequency silencing.

Claims

1. A silencer or noise suppressor intended to afford improved low-frequency damping, and adapted for ventilation ducts or ventilation apparatus, said silencer comprising one or more porous elements (1—3), e.g. of mineral wool, serving as resistive sound absorbers and arranged in a duct or apparatus casing, solely as wall cladding or as baffles swept over by the air stream, characterized in that one or more of the porous elements (1—3) has its upstream and downstream ends (4 and 5) surrounded by substantially unperforated sheet-like material (6), preferably metal sheet, each element having an

intermediate portion (7) on one or more of its surfaces extending along the path of the air stream, said portion (7) having a free surface, or one covered by a perforated material, such that reactive damping is also obtained.

2. Silencer as claimed in claim 1, characterized in that the intermediate portion 7 is covered by perforated sheet metal, expanded metal or the like, with at least 20% perforation area.

3. Silencer as claimed in claim 1 or 2, characterized in that the substantially unperforated, sheet-like material (6) extends over about 2/3 of the length (L) of the porous element (1—3) in the flow direction of the air stream, or in the direction of sound propagation, and in that the intermediate portion (7) is substantially central in relation to the length (L) of the porous element (1—3).

4. Silencer as claimed in claim 3, characterized in that the length (L) of the porous element (1—3) is about 1/4 of the wave length of the low frequency which is intended to be more heavily dampened than what is enabled by the porous element per se.

5. Silencer as claimed in any of claims 1—4, in the case where these porous elements (1, 2) comprise right parallelepipedic bodies serving as baffles, characterized in that the substantially unperforated sheet-like material (6) at either end of the respective porous element (1, 2) consists of a metal sheet covering the end wall of the element (1, 2) and folded round the edges of this end wall to extend along the sides of the element swept over by the air stream.

6. Silencer as claimed in claim 5, characterized in that each of the end wall sheets (6) is flat along the side of the element swept by the air stream, and terminates substantially square to said intermediate portion (7).

7. Silencer as claimed in claim 5 or 6, characterized in that the porous elements (1, 2) are arranged one after the other in rows, end wall to end wall.

8. Silencer as claimed in any of claims 1—4 in the case where the porous element (3) has the shape of a hollow right cylindrical body which solely has a wall cladding function, and is arranged between an outer, unperforated casing (8) and a perforated tube (9) concentric with the casing (8) and constituting a passage for the air stream, characterized in that only a portion of the tube (9), constituting said intermediate portion (7), is perforated, whereas the remainder thereof is unperforated, or in that said tube (9) is perforated for its entire length, but upstream and downstream of said intermediate portion (7) said tube has its walls screened by substantially unperforated material, such as stub ends or ends of adjoining ducts thrust into said tube (9).

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